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PIGS AND DEER FROM THE ASIATIC EXPEDITIONS[1]

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Although the pigs of China and Mongolia are at best subspecies differing very little from the wild pig of Europe, the deer family is here better represented in genera and species than in any other part of the world. Such boreal types as the roe, moose, and wapiti are found in the northern parts where there is more or less continuous forest, while such typically southern deer as muntjacs and sambar inhabit the southern Chinese provinces. Notable are the various small primitive genera such as the widely distributed musk deer, the localized swamp deer (*Hydropotes*) of the Yangtse Valley, both lacking antlers, and the tufted deer (*Elaphodus*) with its minute antlers, apparently confined to China. The spotted Sika deer is peculiar to eastern Asia, and the extraordinary David's deer is known only from captive animals. From time to time, various names have been bestowed on both deer and pigs, so that their synonymy is often complicated and for lack of sufficient specimens it has been difficult to form a just estimate of the validity of many of the so-called species. In the following brief account of the collections made by the Asiatic Expeditions I have attempted to determine the status of these various names. In some cases the series of skins and skulls has been fairly adequate, and probably I have had, all told, more and better specimens for study than any previous investigator. This is due to the splendid work of Dr. Roy Chapman Andrews, leader of the expeditions, and to the able coöperation of his associates, especially Mr. Clifford H. Pope and Rev. H. R. Caldwell.

Suidæ

With the material at hand, consisting of skulls and skins of various ages, it is obvious that several slightly marked geographic forms of *Sus scrofa* are represented in Mongolia and China, but the proper subspecific names of these, as well as their distribution, must continue to remain in doubt until additional material from critical areas can be assembled and studied. The nomenclature of the pigs of eastern Asia is complicated

[1]Publications of the Asiatic Expeditions of The American Museum of Natural History. Contribution No. 101.

by the fact that Père Heude, in a series of papers, proposed various names based on slight individual or minor variations, often creating several "species" from skulls collected in a single locality with little regard for differences of age, sex, or individuality. Lydekker, in his 'Catalogue of Ungulate Mammals' (1915), ignores the greater part of these, but Sowerby two years later, 1917, made a laudable attempt to review Heude's work from a study of the original specimens preserved in the Sikawei Museum at Shanghai, and succeeded in reducing the eighteen "species" of Chinese pigs to five. In again reviewing the whole matter in the light of the material collected by the Asiatic Expeditions, I find myself to some extent in disagreement with Sowerby's conclusions as to the proper names to be employed, yet it must be admitted that the following determinations are at best merely tentative.

Sus scrofa ussuricus Heude

Sus ussuricus Heude, 1888, Mém. concern. l'Hist. Nat. de l'Emp. Chin., II, p. 54, Pl. xvii, fig. 1. Ussuri Valley.

A single immature female, taken August 27, 1919, sixty miles northeast of Urga, Mongolia, is provisionally referred to this race. The locality is near the edge of the wooded country that borders the northern part of the Gobi Desert, to the south of which the forest-living species do not occur until favorable conditions reappear on the other side in northern China. In its coloration the specimen agrees more or less with the description of typical *Sus scrofa* of western Europe. The neck and body are a general pale gray-brown, the long coarse hairs having extensive whitish bases and pale-brown or drab tips. On the shoulders the hair in the midline is longer, forming a drab crest with very little intermixture of white; the forehead and cheeks are mixed dark brown and whitish; the backs of the ears, and a small patch behind the snout, are dark brown, the ears with white hairs along the anterior rim. The chin is also dark brown and this color extends back as a narrow line to the axilla, separating a white mustachial line behind the angle of the mouth from the white area of the throat, where the direction of the hairs is reversed. Both fore and hind feet are dark brown to the hoofs, blending above with the general color of the body, and the tail terminates in a tuft of long, blackish-brown hairs. There is an abundant growth of fine woolly hair, pale brown in color, at the base of the longer hairs. In its pale coloring this pig is very different from any of those from China, and in this respect is apparently like typical *S. scrofa*, from which it differs in the clearly

defined white line at the angle of the jaw, characteristic of eastern pigs. The skull, though obviously immature, differs from all the Chinese specimens, and resembles those of Europe in the closer approximation of the temporal angles at the occiput, where they are only 26 mm. apart, a distance that would probably decrease with age.

It may be assumed that this pig is not very different from those of Manchuria, so that I have ventured to apply to it Heude's designation *ussuricus*, the type-locality of which is the Ussuri Valley in that country. He, however, named four other pigs from the same general region: *Sus canescens*, *S. gigas*, *S. songaricus*, *S. mandchuricus*; and Sowerby, in 1917, accepted *gigas* as the valid one of these. But, unfortunately, *gigas* was not published till 1892, in the second part of the monograph, while *ussuricus* occurs on p. 54 of the first part (1888) and, although mentioned in a preliminary way, is identifiable by a statement of the locality and a reference to the accompanying plate where part of the dentition is figured. It must, therefore, probably replace *gigas*. No doubt, also, Nehring's *Sus leucomystax continentalis*, published in 1889, is a synonym.

Sus scrofa moupinensis Milne-Edwards

Sus moupinensis Milne-Edwards, 1871, Nouv. Arch. Mus. d'Hist. Nat., Paris VII, Bull., p. 93. Moupin.

Milne-Edwards was the first to give a distinctive name to a Chinese pig. His type-specimen was a skin and skull collected by Père David in the district of Moupin, Szechwan Province, and was described as differing from *S. scrofa* of Europe in the shape of the skull, in which the forehead is markedly convex instead of nearly plane, and the occiput between the temporal fossæ is much wider. These differences, in addition to the usual presence of a paler (whitish or yellowish) line directed back from the angle of the mouth, seem, in general, distinctive of the Chinese pigs in comparison with those of Europe. Specimens from northern China, Shensi and Shansi, average paler in color and have more abundant under wool than those from Fukien collected by the Asiatic Expeditions, and the skulls, although otherwise practically identical, are very slightly wider across the forehead. It is a question, however, whether the Moupin pig more nearly resembles the Shansi and North China specimens or those of South China. A single female skull from Tachienlu, just west of Moupin (in the Museum of Comparative Zoölogy), may be regarded as typical of *moupinensis* and, since it has the broad forehead of the specimens from Shansi, I am following Sowerby in regarding the pigs of North

China and the western highlands as of this race. It is true, however, that pigs do not go to any great altitude in these mountainous regions, and it may turn out that typical *moupinensis* is the same as the animals of the Yangtse basin and southern China instead. In this case, Heude's name *dicrurus* is available for the northern pigs, first used in the 1888 paper (p. 55) for a pig from the upper Han River, Shensi, the teeth of which are figured in his plate 17. Heude also gave the names *oxydontus*, *laticeps*, and *curtidens* to pig skulls from this same area, the first of which is a *nomen nudum* in the 1888 paper; while the two latter do not appear until 1892, in the second part, where all four are illustrated by figures.

The small series of Shansi skins secured by the Asiatic Expeditions agree in being uniformly paler in coloration than the series from Fukien Province, and Howell records the same as true of the Chinese pigs in the U. S. National Museum. At least two distinct types of coloration occur: one in which the body is chiefly blackish with a sprinkling of white hairs; the other in which the body is chiefly ochraceous, more or less mixed with black. In both, the throat, lip stripe, and lining of the ears are white. There is a well-developed coat of fine woolly hairs hidden at the bases of the longer over-hairs, which is either lacking or scarcely developed in the pigs of southern China in summer.

Sus scrofa chirodontus Heude

Sus chirodontus Heude, 1888, Mém. concern. l'Hist. Nat. de l'Emp. Chin., II, p. 54. Kiangsi, Po-yang Lake.

The fine series of pigs secured in Fukien Province by members of the Asiatic Expeditions obviously differs from the North China series in the darker coloration. Some are practically all black with a suggestion of a pale line at the angle of the mouth, but most of them are of the "red" type in which the long hair is mixed black and deep rusty to maroon, only one of the series approaching the mixed ochraceous and whitish condition common to the North China skins. In addition, the fine wool at the base of the longer hair is lacking in the summer coat and but scantily developed at other seasons. The skulls of the two are barely distinguishable; those from Fukien average, however, slightly narrower across the forehead in proportion to their length.

The selection of the appropriate subspecific name for the pig of South China is again not so simple as first appears. Heude, in his 1888 paper, p. 54, first introduces *Sus chirodontus* with a statement that the elaborate description that follows is chiefly based on this species, which comes from

the basin of Po-yang Lake. This statement is further accompanied by comparative notes concerning *S. chirodontus* and the extinct *S. erymanthius* Gaudry, so that the name as here first published is not a *nomen nudum*, as Sowerby must have believed when he employed Heude's *Sus paludosus* for the same animal. The latter name does not appear until 1892 (p. 110 of the second part of the monograph), where it is apparently a substitute name for *S. palustris* Heude, proposed in a footnote on p. 54 of the 1888 contribution for the South China pig that Swinhoe had earlier referred to *S. leucomystax*, the local race of Japan. But *Sus palustris* Heude is preoccupied by *S. palustris* Rütimeyer, a Pleistocene pig of Europe. Heude, in his five papers on pigs, uses the following names for those of South China: *chirodontus, palustris, acrocranius, leucorhinus, melas, phyllodontus, paludosus, pacificus, collinus, flavescens, chirodonticus*; and in the second of these contributions (Mém. concern. l'Hist. Nat. de l'Emp. Chin., 1892, II, p. 102) proposes that the Chinese pigs be included in a separate genus, *Sinisus*. Sowerby, in studying Heude's specimens at Shanghai, found two other manuscript names, *stricticeps* and *nigricans*, written on skulls from South China, and in his paper misquotes *melas* as *meles*, based on a skull from Kwangsi with a broad forehead and one less upper premolar than normal.

Wild pigs are common in Hainan, although not included in J. A. Allen's summary list of the mammals of that island. A large series of young was collected there by Mr. Clifford Pope in 1923, chiefly at Nodoa. All are very small and show the striped pattern. They were taken in late January and during February and March, which may thus represent the breeding period of the year. Two skulls of immature boars, in December, have the last molar still unerupted and seem indistinguishable from skulls of *S. s. chirodontus* at a like stage, so may be provisionally included with this race of southeastern China.

Cervidæ

Capreolus capreolus bedfordi Thomas

Capreolus bedfordi Thomas, 1908, Abstr. Proc. Zoöl. Soc. London, p. 32.

A series of over fifty roe deer from Mongolia (northeast of Urga), from Chihli (Lao Tsa Tsu), and from localities in Shansi, shows a large amount of purely individual variation in color. The type-locality of Thomas's *C. bedfordi* is one hundred miles northwest of Tai-yuen-fu in central Shansi, and the chief distinguishing character seems to lie in the lesser size as compared with *C. pygargus* of the Semiretshinsk Altai

some 1800 miles to the westward. Still farther to the west there seems to be no doubt that intergradation takes place with the smaller races of Europe, for all the differences given for the Asiatic roes are of degree only. I am therefore relegating *bedfordi* to the status of a subspecies of *C. capreolus* instead of regarding it as a distinct species as Lydekker has done ('Cat. Ungulate Mamm. Brit. Mus.,' 1915, IV, p. 224) or making it a form of *C. pygargus* as Flerov has suggested (C. R. Acad. Sci. URSS, 1929, p. 429). I can find no constant differences that would serve to distinguish the Shansi roe from those of Chihli or northern Mongolia. The cranial measurements of all are closely similar, and the skins show the same variations where comparable material is available. In the bright reddish coat of summer there is a certain difference in tint, some being slightly paler with less extensive dark bases to the hairs, while the backs of the ears in specimens from the same locality in this pelage may be either a more or less even mixture of black and buff with black edges at the tips, or nearly the entire central area may be black. It seems to have been a variation of the latter sort that served as the type of *C. melanotis* Miller, from eastern Kansu, and which I have little doubt may be regarded as synonymous with *bedfordi*, for the cranial measurements are the same. A similar variation of color is seen in the spotted fawns, two of which from northeast of Urga agree in being much redder than a third that is decidedly more brown. In winter pelage the coat is a fairly uniform buffy gray, due to the subterminal pale-ochraceous rings and black tips of the individual hairs. On the sides and flanks the buff tint becomes clearer, and may be intensified to a rich ochraceous. The throat is usually more or less frosted with whitish, and in occasional specimens there are larger blotches of white. The absence of black marking on the upper lip and at the angle of the lower jaw is given as a distinguishing character of this race, but the present series shows that there is wide individual variation in this respect. The white spot at each side of the muzzle may be practically absent, or it may be small, or again more extensive, forming a white border to the fore part of the upper lip. The dark mark directly behind it may also be obsolete, while in other individuals from the same locality it may form a prominent spot, or mustache mark, or even extend across the muzzle as a dark brown band just back of the naked nose-pad. In a similar way, the dark mark at the angle of the lower jaw may be absent or more or less extensive. It is evident that no reliance can be placed on the absence of these markings as a distinguishing trait. The chin is usually white, but in some skins the whole interramal area is also white. The roe deer seems to be char-

acteristic of forested areas in northern China, the single specimen from Wanhsien, in eastern Szechwan, marking probably about its southeastern limit.

Moschus moschiferus moschiferus Linnæus

Moschus moschiferus Linnæus, 1758, 'Syst. Nat.,' 10th Ed., I, p. 66.

In a recent paper, Flerov (C. R. Acad. Sci. URSS, 1928, p. 515) has briefly reviewed the races of musk deer, and regards the typical form as that found in the "mountains of Western and Central Siberia." Linnæus merely states that it is found in "Tatari versus Chinam," a most indefinite locality, but perhaps to be interpreted somewhat as Flerov has done. The latter, however, considers the musk deer of eastern Siberia and northeastern Mongolia as a separate race, using for it Pallas's name, *sibiricus*. The chief differences noted are the smaller size, 151–158.8 mm. in length of skull, instead of 154.2–163.5 mm., as given for typical *moschiferus*, and the slightly grayer color—differences that seem, after all, unimportant in view of the considerable overlapping of the measurements. A fine pair of these little deer was secured by the Asiatic Expeditions 45 to 60 miles northeast of Urga, Mongolia, and is here referred to the typical race in spite of their small size (skull length 150 mm.). Both specimens, taken in late August, are changing from summer to winter coat, one of them having the new pelage short and dark grayish-brown, with a tuft of the stiff quill-like hairs of the caudal region still present, the other (August 24) with the new hairs just beginning to show in small patches on the withers and flanks, of a much darker shade than the old faded brown of the summer coat. Both are in the spotted phase, with about four lengthwise rows of indistinct pale or whitish spots on each side of the body. These are formed by the concentration of hairs having a whitish subterminal band, while on the flanks, neck, and limbs these white tips are scattered, giving a slightly grizzled effect. In a third specimen (? locality) the spots run together into prominent stripes on the sides and smaller indefinite markings on the shoulders and back. The interramal area is white in one, not in the other, and a white stripe passes down each side of the throat. The legs are mixed dark brown and gray, the front of the fore legs in the three skins at hand nearly clear dark brown.

The first musk deer to reach Europe was perhaps the one mentioned by Marco Polo, the Venetian traveller, who in the thirteenth century brought back with him the head and feet of a specimen he

secured in his journey to "Tatary." He mentions it as abundant in the Altai and northern Chinese country, especially about Si-fan. Linnæus refers only to Ray, whose account is a transcription of that by Grew of a specimen then in the museum of the Royal Society of London. Pallas, in 1779, gave the first really good description and figures of the anatomy and external appearance, although a generalized figure showing the canines appeared much earlier, in the treatise on musk by Schroeck, in 1682.

Moschus moschiferus sifanicus Büchner

Moschus sifanicus BÜCHNER, 1890, Mélanges Biol., XIII, p. 162.

The collections contain a single specimen without locality or skull that seems referable to this race.

The status of the musk deer of Kansu, Szechwan, and Nepal is still in need of more thorough investigation. Originally described from northern Kansu as a distinct species, *sifanicus* was believed to differ from the more northern *moschiferus* in having the ear longer, with the inside yellowish, and the outside black, instead of being white inside and grizzled like the head on the outside. Other differences were said to be the uniform instead of spotted coat and the longer rostral part of the skull; but occasional specimens of *M. moschiferus* may be unspotted (the variety *concolor* of Milne-Edwards) and the supposed greater length of the ears proves to be a mistake. The cranial differences, however, are well marked, particularly the longer rostrum, the larger cheek teeth, the shape of the lacrymal bone (longer than high), and the more forward extension of the median palatal notch. Lydekker, in 1915 ('Cat. Ungulate Mamm. Brit. Mus.,' 1915, IV, p. 7), regarded this Chinese musk deer as a subspecies of *moschiferus*, while more recently, Flerov (C. R. Acad. Sci. URSS, 1928), in a preliminary review of the group, recognizes *M. chrysogaster* Hodgson, of Nepal, as a distinct species with *sifanicus* as its northern race, and describes as new *M. berezovskii*, a smaller animal of Szechwan. Undoubtedly, the two first are very closely related, but in view of the occurrence of intermediate links it may be that Lydekker's view is nearer the truth, while it seems very doubtful if *berezovskii* can be more than a small individual of *sifanicus* with the description of which it otherwise agrees. A young male of *sifanicus* from Shuow-low, Szechwan, in the Museum of Comparative Zoölogy, has a cranial length of 154 mm., its coat is unspotted, yellowish below and on the ears, while the feet are gray instead of dark brown as usual in *moschiferus*. There is, however, considerable variation in color in these

animals. No one has carefully compared Chinese specimens with those from Nepal and if it should prove that they are the same, Hodgson's name, *chrysogaster*, with fifty years priority, might replace *sifanicus*. The only available Nepalese skull is smaller than that from Szechwan, though a little younger, but otherwise agrees with it in the differential characters mentioned.

Hydropotes inermis inermis Swinhoe

Hydropotes inermis SWINHOE, 1870, Proc. Zoöl. Soc. London, p. 89.

A small species with much superficial resemblance to the Chinese race of musk deer in its mixed yellowish and brown coat and the large canine tusks of the male. The head, however, is colored like the body and the feet are less dark, while in the skull the presence of a preorbital pit at once separates it.

This swamp deer is common in the river marshes of eastern China. The collection contains specimens from Chinkiang, Kiangsu Province (the type-locality), and from Tunglu, Chekiang, and Yochow, in Hunan.

Elaphodus cephalophus cephalophus Milne-Edwards

Elaphodus cephalophus MILNE-EDWARDS, 1871, Nouv. Arch. Mus. d'Hist. Nat., Paris VII, p. 93.

Small deer of a nearly uniform dark chocolate-brown, becoming blackish on the limbs; throat, muzzle, and sides of face paler, finely grizzled; a gray line over the eye bounding a large frontal tuft of longer, brown hairs, which in the male nearly hide the short antlers on the ends of pedicels; white of inside of ear extending to the tip of the outer side; upper canine large in males, small in the females which are hornless.

This deer was first discovered in Moupin, Szechwan, by Père David. It is the largest of the races. A single adult female, taken at Lichiang, Yunnan, extends the known range considerably to the southwestward. Its skull measures 190 mm. in condylobasal length and is practically identical in size with that of a male figured by Milne-Edwards. The Lichiang skin is much darker than those representing the race *ichangensis* in which the general shade is less blackish, the basal portion of the body hairs slightly paler, while the ears are white only at the tips of the external side, instead of having a considerable part of the antero-external margin white.

Elaphodus cephalophus ichangensis Lydekker

Elaphodus ichangensis LYDEKKER, 1904, Proc. Zoöl. Soc. London, II, p. 169; Abstract, p. 10.

A slightly smaller race, typical in the country about Ichang. It is supposed to be an upland animal rather than a marsh-liver.

The Asiatic Expeditions secured three specimens near Wanhsien on the borders of Szechwan, above Ichang, that undoubtedly represent this race, while the Museum of Comparative Zoölogy has one female from Pudsee, Hupeh. Lydekker ('Cat. Ungulate Mamm. Brit. Mus.,' 1915, IV, p. 39) regards this as the most distinct of the four races he recognizes, but since he had only one specimen he could not determine the amount of individual variation, and admits that except in its slightly smaller size, smaller, deeper and more nearly oval antorbital pits, the skull is not especially characterized. It is, in fact, merely transitional to the coastal race. He supposes also that the amount of white in the tail is greater in this race and includes the terminal third, but this is not true of the four skins in the present series, for white markings are always likely to be variable in extent; yet the white on the outer rim of the ear is more extensive than in the single female of *cephalophus* from Lichiang.

Elaphodus cephalophus michianus (Swinhoe)

Lophotragus michianus SWINHOE, 1874, Proc. Zoöl. Soc. London, p. 452.

Smaller and more slender of skull than the other races, with narrow, pinched-in nasals. The type-locality is Ningpo, Chekiang Province, which must be close to the northern limit of the species' range. The Museum of Comparative Zoölogy has a pair of topotypical skulls that bear out the distinctness of this race. The most noticeable characters of the skull are its slenderness, and especially the narrow nasals which are peculiarly compressed or pinched together posteriorly instead of being flattened or spreading. The lacrymal pits are also slightly less in their vertical diameter. This, however, as well as the amount of white on the tips of the ears is variable and hardly forms a criterion for racial distinction. Lydekker further described a race of this deer as *fociensis* on the basis of a female from Fukien Province, which he says is "rather larger" with more white on the upper part of the ears. A skin from Yenping, Fukien, in the collections of the Asiatic Expeditions does not seem distinguishable nor do the measurements of the skull given by Lydekker differ from those of *michianus*, of which *fociensis* is doubtless to be regarded as a synonym.

Muntiacus muntjak vaginalis (Boddaert)

Cervus vaginalis Boddaert, 1785, 'Elenchus Anim.,' I, p. 136. Ind a.

Wroughton, in 1915, compared a considerable series of Indian muntjacs, and concluded that those inhabiting Nepal, Upper Burma, and the Bengal region were all referable to *vaginalis*, a conclusion which Lydekker embodied also in his 'Catalogue of the Ungulates in the British Museum.' To this race apparently belong the five specimens from southwestern Yunnan secured by the Asiatic Expeditions, as well as a skin and skull in the Museum of Comparative Zoölogy from Tonkin. They are slightly smaller, with less robust antler pedicels and smaller antlers than the typical Javanese form. In color, the forehead is dusky, the crown bright ochraceous, the throat white. The neck, as far as the shoulders, is bright ochraceous slightly ticked with blackish. The back, including the upper surface of the tail, is bright chestnut, paling on the flanks and belly to ochraceous. The feet and legs are usually ochraceous, with sometimes a slight brownish wash near the lower extremities. The upper throat, insides of ears, axilla, groin, edge of buttocks, and lower side of tail are clear white. Evidently this larger muntjac with the chestnut tail is characteristic of the warmer latitudes, for it just reaches southern Yunnan (specimens from Teng-yueh, Taipingpu, Pehte, and Namting River) and Tonkin. It appears again on the island of Hainan, where it seems to be sufficiently differentiated to be worthy of subspecific distinction, as follows.

Muntiacus muntjak nigripes, new subspecies

Cervulus vaginalis Swinhoe, 1869, Proc. Zoöl. Soc. London, p. 652 (part).

Cervulus muntjak J. A. Allen, 1906, Bull. Amer. Mus. Nat. Hist., XXVIII, p. 468.

Muntiacus muntjak, subspecies, Lydekker, 1915, 'Cat. Ungulate Mamm. Brit. Mus.,' IV, p. 25.

Type.—Adult male, skin and skull, No. 60082, American Museum of Natural History, from Nodoa, island of Hainan, China; December 29, 1929; Clifford Pope, collector; Third Asiatic Expedition.

Description.—Slightly smaller than *M. m. vaginalis* as represented by specimens from Yunnan. Forehead in front of eyes, and the muzzle, dusky brown; sides of face and the crown clear bright ochraceous; a broad black mark on the front of each antler pedicel. Ears ochraceous at base becoming dusky at tips; their inner surface scantily clothed with white hairs. Chin and interramal area white to pale buffy. Dorsal area of neck dark chestnut-brown, shading to bright chestnut on the back and upper surface of tail, slightly paler (bright ochraceous) on sides of neck, throat, and flanks. The neck (especially) and the body are minutely ticked with black, through the black subterminal bands of many of the hairs. Fore shoulder and

fore limb blackish brown becoming clear brown on the foot; hind leg similarly blackish near the hock, paling to brown on the front of the foot. Inner side of both legs ochraceous at the upper part. Axilla and groin white, the latter area continuing on the inner side of the leg to the heel, and dorsally to include the posterior edge of the buttocks and under side of the tail.

SKULL.—In all its dimensions the skull is slightly smaller than that of *vaginalis*. The antlers are small, their tips curving slightly inward and down. Their anterior basal point is very little developed, a bare projection, while their pedicels are apparently shorter. The tooth row is shorter and the size of the individual teeth is less.

MEASUREMENTS.—The skull of the type measures: condylobasal length, 181 mm.; basal length, 170; palatal length, 109; orbit to tip of muzzle, 102; zygomatic width, 86.5; mastoid width, 63; width outside molars, 61.5; upper cheek teeth, 61; lower cheek teeth, 67; length of antler pedicel, 89; length of antler, 56.

Swinhoe, in 1869, recorded this type of muntjac from Hainan, and Lydekker, in his 'Catalogue' of 1915, lists two skins obtained there by Swinhoe as representing an undetermined subspecies. The series secured by Mr. Pope indicates that in addition to the smaller size of this island race it is further distinguished by the darker legs which may be almost black or a paler brown. In the Indian race, represented by skins from Yunnan, the legs are usually clear ochraceous, though occasionally slightly tinged with pale brown.

The muntjacs of this group are easily distinguished from the smaller Chinese species by the larger skull and teeth, longer pedicels of the antlers, and by the relatively smaller suborbital glands which occupy only about the ventral two-thirds of the lacrymal bone. Further, the premaxillary abuts against the nasal at its upper extremity instead of being separated from it by a forwardly projecting strip of the maxillary.

Muntiacus reevesi (Ogilby)

Cervus reevesi OGILBY, 1838, Proc. Zoöl. Soc. London, p. 105.

Similar to *M. m. vaginalis* but about a third smaller, the coat slightly darker and more uniformly ticked, usually with a blackish nuchal line, which in females extends over the occiput and forehead to form a wide patch connecting the two black streaks marking the frontal ridges. Summer skins tend to be brighter, with clearer ochraceous flanks.

This muntjac seems to be confined to the southern half of China, for the most part, at lower elevations, for although recorded (under the name of *Cervulus lacrymans*) from Moupin by Milne-Edwards, it seems likely that his specimen came from somewhere in the upper Yangtze Valley rather than from higher altitudes of central Szechwan. The collections made by the Asiatic Expeditions contain over sixty skins and skulls of

muntjacs from Fukien, Kiangsu, Hunan, Chekiang, and eastern Szechwan, which, together with a series in the Museum of Comparative Zoölogy from Hupeh Province, form an excellent basis for an estimate of the validity of the various nominal forms that have been described. Lydekker, in 1915, recognized three species as occurring in South China, with three additional subspecies. These were: (1) *M. lacrymans* of Milne-Edwards (type from Moupin, Szechwan) and two subspecies, *teesdalei* (from Tatung, Anhwei Province) and *sclateri* from Ningpo; (2) *M. reevesi* (type assumed to have come from Canton) and its subspecies *pingshiangicus* Hilzheimer from Anhwei Province; (3) *M. sinensis* Hilzheimer (type-locality also supposed to have been Anhwei) with which is included Lydekker's *Cervulus bridgemani*.

With the excellent series of over seventy specimens now before me, representing most parts of the animal's range, I can see no ground for recognizing more than a single form, *reevesi*, as A. B. Howell had already suspected. The original description is quite inadequate, for Ogilby merely mentions that it is less red than the Indian muntjac and lacks the white above the hoof. He had, as the basis of his brief account, a male, a female, and a spotted fawn, then (1838) living in the Zoölogical Gardens at London, whither they had been sent from China by J. R. Reeves, hence presumably from the Canton region. Milne-Edwards, in 1871, was the next to apply a name to this animal by distinguishing as *Cervulus lacrymans* a specimen sent by Père David from Szechwan, supposedly from Moupin, but perhaps from a less elevated district to the south. He remarks briefly that it differs from *reevesi* in the nearly parallel instead of divergent pedicels of the antlers. This, however, is purely an individual character, for in adult males from the same locality in the present series, some have divergent and others parallel or even incurving pedicels. In details of color, skins from eastern Szechwan (Wanhsien) can be matched by those from Fukien. Lydekker also uses the supposed greater divergence of the pedicels ("at least frequently") as a character of *M. sinensis* to distinguish it from *reevesi*, but since he had only two males, the distinction can hardly be regarded as valid in view of the variation shown among the twenty or more skulls from Fukien in the present series; the additional character of the narrowness of the nasals at their point of contact with the maxillæ proves also to be an individual matter. Swinhoe, in 1872, described *Cervulus sclateri* from Ningpo, Chekiang, but seems to have been led to do so chiefly because the fawns are spotted, while those of the Hainan muntjac he supposed

to be unspotted. But we know now, that the Hainan muntjac is of another species, of which Mr. C. H. Pope brought back a number of spotted fawns. It is true, nevertheless, that these are darker, and the spots seem to be lost at an early age. In several specimens from Chekiang and Hupeh, I can see nothing to distinguish *sclateri*. The other described forms (*teesdalei, pingshiangicus, sinensis, bridgemani*) seem to rest chiefly on purely individual or sexual variations in color, all of which may be found in the excellent series from Fukien. For, while the usual color is a mixture of bright ochraceous minutely ticked with blackish on the dorsal parts of neck and body, this may be intensified to a dull chestnut or, through a lack of dark tips to the hairs, the flanks may be nearly clear ochraceous. Occasional specimens are much darker, owing to the extensive dusky bases of the hairs and the black tips, so that the entire sides of the body may be dull drab, the legs dark brown, and the cheeks darkened as well. The dark median line on the neck may be little developed, but usually extends at least half-way to the withers, and in females spreads out anteriorly to form a dark brown patch covering the forehead, while in adult males the forehead becomes brighter and clearer ochraceous-rufous with age, and the black is confined to the pedicel of the antler. A remarkable change with age is the increasing yellowness of the backs of the ears in males for, while in females and younger males the ears are dark blackish brown externally, with advancing age the clear ochraceous of the base in males encroaches more and more upon the exterior of the conch, until the entire back of the ear is of the same bright tint as the occiput and forehead. It is obvious that the various named races of Reeves's muntjac have been described without sufficient knowledge of the changes that take place in this sex. The antlers have a very small basal point, often hardly more than a projection, while the tips usually turn inward and downward. Swinhoe believed that the antler pedicels became shorter with age, but, although they undoubtedly increase in diameter and vertical thickness, the length seems to be an individual matter, varying in immature specimens of comparable age as well as in adults from the same locality showing corresponding conditions of tooth wear and cranial development.

This species differs notably from *M. muntjak* and its races in the much larger antorbital pit which occupies all but a narrow dorsal strip of the lacrymal bone and in the relatively shorter ascending branch of the premaxillary which does not reach the nasal but is separated from it by an intervening strip of the maxillary.

Muntiacus crinifrons (Sclater)

Cervulus crinifrons SCLATER, 1885, Proc. Zoöl. Soc. London, p. 1, Pl. I.

A large muntjac, two feet high at the shoulder, of a general dark blackish-brown color, including the dorsal surface of the tail, but the head and neck very slightly mixed with ochraceous; forehead, sides of the face, backs of the ears, and the occiput including its well-developed tuft of longer hairs, ochraceous; interramal area, a small mark above each hoof, the edges of the buttocks, the lower side of the tail, and the inguinal area white, the last with a narrow ochraceous border. Antlers short, with a small projection on the inner side at the base.

This muntjac is at once distinguished by its large size and dark color, with the upper side of the tail blackish instead of reddish. Originally described from an animal sent to London by A. Michie, from Ningpo, Chekiang Province, eastern China, but one other specimen has been recorded, namely, one secured after much effort by Styan, the fate of which seems not to be known. Special interest therefore attaches to the capture of a third specimen, a male, brought back by the Asiatic Expeditions from Tunglu, Chekiang Province. It is adult with well-worn teeth, but the antlers, though very short, projecting only 65 mm. (2.55 inches) beyond the pedicel, are an inch longer than those of the type, hitherto the world's record. Probably this is a species close to the verge of extinction, of which a few remain in eastern China.

Rusa unicolor dejeani Pousargues

Rusa dejeani POUSARGUES, 1896, Bull. Mus. d'Hist. Nat., Paris, II, p. 12.

This sambar of Szechwan was provisionally named over thirty years ago, by Pousargues, who considered it very similar to the smaller race *swinhoei* of Formosa, but with a more bushy tail. No further comparisons have since been made to determine its distinctness from the large *R. unicolor* (type-locality, Ceylon) or *R. unicolor equinus* (type-locality, Sumatra) of India and Malaya, respectively. In the last (9th) edition of Rowland Ward's 'Records of Big Game,' 1928, antler measurements are given of the type in the Paris Museum, and of another in Lord Rothschild's possession, slightly larger, said to have come from "N. W. China." In the latter specimen, the length of antler on the outside curve is said to be 31 inches, or about the same as a large head of the Malay sambar (26–33 inches), while the greater bushiness of the tail, to judge from descriptions, seems unreliable as a distinctive character. For the present the race may be retained as Lydekker, in his 'Catalogue of Ungulates,' 1915, has done.

An adult female sambar was taken at Lichiang, Yunnan, by the Asiatic Expeditions, and is referred to this race. The entire pelage is stiff and coarse, the tail full and about 400 mm. long to the tips of the hairs. In color the forehead and backs of ears are grayish brown; a patch of darker clear brown behind the rhinarium extends as a narrow median line back to the level of the eyes; eyes surrounded by a broad ring of dull ochraceous; chin, except for a dark-brown spot in advance of the angle of the jaw, dull white, passing into pale drab on throat; neck drab-brown becoming darker and tinged with ochraceous posteriorly, especially on haunches; body generally dark brown becoming brighter or more rusty on the haunches with the admixture of ochraceous, tail rusty brown at the base, its terminal two-thirds nearly black. The feet are pale, nearly buff, with a faint trace of a dark median stripe down the front, while the metatarsal gland is surrounded by a pale rusty ring; axillary and inguinal regions, and edge of buttocks white. A second specimen, from Wa-tien, Yunnan, a male, is very much darker with a uniform rich dark-brown muzzle, cheeks, ears, and neck. The chin and upper throat are whitish. Posteriorly, the rusty tint is darker, extending on to the base of the tail. The feet are pale with an indication of a narrow median stripe as in the female.

Cervus canadensis xanthopygus Milne-Edwards

Cervus xanthopygus Milne-Edwards, 1867, Ann. des Sci. Nat., Zool., (5) VIII, p. 376.

The nomenclature of the wapitis of eastern Asia is much in need of revision for which Lydekker's 'Catalogue of Ungulates' (1915) has only partly cleared the way. A. B. Howell has shown that the present animal is distinguishable by its reddish tone from the wapiti of northwestern China, to which Pocock gave the name *kansuensis*. The type of *C. xanthopygus* came from Manchuria, and the range is supposed to extend into the northern part of that country. I am provisionally referring to it the skin of a doe secured by Dr. R. C. Andrews, August 21, 1919, sixty miles northeast of Urga, Mongolia. It has practically shed its summer coat, of which scattered ochraceous hairs still remain on the fore shoulder and haunches, while the fresh drab-gray pelage of the new coat is still very short. The neck has a decided mixture of buff, and there is a dark-brown line from the occiput to withers. The chin is dark brown, pale at the sides in front of the dark mark near the corner of the mouth. In comparison with a series of both sexes representing *kansuensis*, it is decidedly more buffy on the neck, the rump disk is more extensive for-

ward and of a deeper ochraceous, while the hoofs are considerably larger than in any of the Kansu animals, measuring 66 mm. along the median edge on the forefoot, and 67 mm. on the hind, against 53–60 and 60 mm., respectively, for the largest of the latter.

Lydekker, in his 'Catalogue' (1915, p. 134), proposed the name *Cervus canadensis baicalensis* as a substitute for his previous *C. c. asiaticus* quoted as from Severtzow (1873), but now rejected since the latter author apparently used the term *asiatica* in a group sense, not as a technical name, while the previous use of *Cervus sibiricus* by Schreber for a reindeer invalidated the employment of that term by Severtzow for this wapiti. The name *C. c. asiaticus* will thus have to date from Lydekker ('Deer of all Lands,' 1898, Pl. VI), with type-locality "the district to the southward of Lake Teletsk, near the sources of the Yenisei," whence the stag figured probably came. It is, however, a matter of uncertainty whether this is really a well-defined race.

The close relationship of the Asiatic wapiti to that of America is expressed by the trinomial, but the latter animal has a dark neck and contrastingly pale body, while the Asiatic representative is more uniformly drab-gray.

Cervus canadensis kansuensis Pocock

Cervus kansuensis Pocock, 1912, Proc. Zoöl. Soc. London, p. 573.

The collections of the Asiatic Expeditions contain five adult skins representing both sexes of this race of wapiti, probably all taken in Shansi. A series of six from the same Province is regarded by A. B. Howell as identical with six topotypes from near Taochow, Kansu, all in the U. S. National Museum, but he adds that he is not in a position to express an opinion as to the validity of the race. In its smaller hoofs and grayer tone, the lack of buffy on the neck, and the paler tint of the smaller rump patch, it seems to differ from *C. c. xanthopygus*. Wallace (1913) in his 'Big Game of Central and Western China,' figures (plate opposite p. 206) a stag of this animal shot in Kansu. The photographs bring out well the small size of the pale rump patch, which is restricted largely to the posterior part of the buttocks, but in the series studied, the dark color of the back may or may not extend as a line across it to the top of the tail. The antlers, as figured by Wallace, are of the usual wapiti type, as far as can be told; and, except for having one less point, do not seem essentially different from those described and figured by Lydekker (Proc. Zoöl. Soc. London, 1910, p. 987) as the type of *Cervus canadensis wardi*. These mounted antlers were from the Szechwan

border of Tibet, and may have belonged to two individuals, although their slight asymmetry is duplicated by those shown in Wallace's photograph. Lydekker himself, in the 'Catalogue' (1915), states that "not improbably" they "may prove to belong to *C. macneilli*," another problematical species based on the skin of a female apparently paler than *C. kansuensis* and possibly of the *albirostris* type, although Lydekker regards it as representing a distinct species of which he makes *C. kansuensis* a more northern race. Certainly, however, the latter is a wapiti, and probably identical with *C. c. wardi*, a name which, if considered identifiable, might then replace *kansuensis*. At present, however, it does not seem possible to settle the status of these names, so that *kansuensis*, well defined by skins and antlered skulls, may be used until further information as to *wardi* and *macneilli* is available.

Alces alces bedfordiæ Lydekker

Alces bedfordiæ LYDEKKER, 1902, Proc. Zoöl. Soc. London, I, p. 109.

The elk or moose of the Old World ranges across the northern part of Eurasia from Norway to Amurland. Lydekker, in 1902, named the Siberian representative on the basis of the lack of palmation of the antlers, taking as his type specimen a pair of antlers from some locality in "Siberia," but exactly where is apparently uncertain. Lönnberg, shortly after, showed that the supposedly characteristic lack of palmation in the antlers occurs also among Swedish elk, while Elwes further suggested that this may be due to the lack of abundant nourishment in certain districts as well as to the elimination, through hunting, of the best-antlered males, leaving those with antlers less developed to breed. Zukowsky, in 1910, made a further contribution to the subject, regarding the elk of northeastern Siberia as a distinct form under the name *Alces pfizenmayeri* (antedating the name given it in 1911 by Millais, *A. machlis yakutskensis*). Zukowsky believed that the elk of Europe ranges across as far at least as the region to the south of Lake Baikal without change, but that the animals to the north of that area are much darker. He described as a new race the elk of the upper Yenisei, *A. machlis angusticephalus*, characterized by having a narrower skull with more prominent ridge between the antlers. It seems likely that the differences separating the eastern from the western animals are very slight indeed, and, until more critical comparisons can be made, the status of the name *bedfordiæ* must be regarded as still uncertain. For the present, however, it may be retained for the elk of central Siberia, meaning perhaps the Altai region, eastward.

The skin and skull of a single immature female were secured by the Asiatic Expeditions sixty miles northeast of Urga, Mongolia, and very likely this marks nearly the southern limit of the range in that country. The skin is a mixed gray and brownish on the cheeks, neck, and sides of the back, but the chest and flanks are clearer, darker brown, and the chin is blackish brown. The forehead and muzzle are tinged with ochraceous and the feet and legs are similar but slightly darker, becoming brown near the hoofs. A short mane stands erect along the median line of the neck and body and a very small (1 inch) "bell" or tuft is present at the throat. Altogether, the specimen appears paler than the moose of eastern North America, but no other Old World material is at present available for comparative study.